REMARKS

Applicants have carefully considered the position set forth by the Examiner in the outstanding Office Action. A number of the claims have been amended so as to more clearly set forth the present invention.

Systems and methods which embody the present invention define feed forward structures and methods which are based on predetermining characteristics of system amplifiers, and, adjusting on a predetermined basis, output power levels of associated laser transmitters. As a result, numerous spans of optical fiber can be coupled together, up to a predetermined number, with the knowledge that the signals received at the final span could be expected to be within the input range of the respective receiver or receivers.

Thus, systems and methods in accordance with the present invention make it possible to preset a plurality of gain parameters for respective laser transmitters, for example, when the assemblages are manufactured, without any need for feedback signals for adjusting gain levels for subsequently. Preset modular units can be installed which, with intervening optical fiber, can couple the signals through a maximum number of fiber elements without having to make any further gain determinations or adjustments to ensure that the receiving circuits, at the end of the last fiber element, do not receive signals which exceed their input range.

In accordance with the above, and as described in the present application:

> "Optical networks can incorporate a power pre-emphasis process which minimizes the power fluctuation range at the network's receivers across a predetermined range of wavelengths. The output power of a selected channel is set according to the pre-emphasis process. Circuitry which implements the pre-emphasis process can be set, on a per-channel basis, at manufacture and when combined with a plurality of transmitters can be provided as a module installable in a network without needing further adjustment.
>
> A given module can be used in conjunction with a variable number of optical spans, for example 4 to 8, with the assurance that the input power variation at receivers coupled to the respective spans will not exceed the respective receiver's sensitivity range." (Last 11 lines, page 4, present application)

> "In yet another embodiment, networks can be formed of a plurality of substantially identical preset transmitter modules which can be coupled to up to a predetermined maximum number of cascaded spans. The preset transmitter modules provide assurance that the downstream optical receivers receive signals from the network which do not exceed their respective input sensitivity ranges. Thus, no field adjustments or settings are necessary. Paths can be added to a network with up to the selected maximum number of spans without further adjustments to the pre-emphasis circuitry." (Page 5, present application)

As described in more detail subsequently, the outstanding rejection of claims 1-4, 6-10, 13, and 15-17 as anticipated by Chraplyvy et al., US Patent 5,225,922 are not in keeping with the standards of anticipation. Anticipation is a well defined doctrine in patent law. It is well recognized that:

> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single, prior art reference." (MPEP 8th ed. REV 2, May 2004, pg 2100-73)

Unlike the claimed methods and structures, the disclosure of the '922 patent is directed to a closed loop control system. With reference to Fig. 2 thereof, controller 56 adjusts output power for transmitter elements P1, P2, P3...PN in response to received power levels at terminal 24 so as to provide equal power output levels for all channels or wavelengths, see Fig. 5 thereof. Thus the system of '922 patent is dynamic and continually changing in response to optical network characteristics.

The system of the '922 patent can be used as disclosed in Fig. 2 thereof for any number of spans. As stated above, '922 patent discloses the use of real time control system to dynamically adjust input power levels such that output power levels assume equal values. This is quite unlike the claimed structures and methods.

Amplifying the above comments, claim 1 requires:

> "a plurality of transmitters of optical signals wherein the members of the plurality emit signals at predetermined, different output parameter values wherein the values are selected in accordance with the gain profile." (Pending claims 1-9)

As described above, and unlike the structures of claims 1-9, the system of '922 patent provides real time feedback adjust an input power levels in response to current conditions. In support of the outstanding anticipation rejections the Examiner stated at the bottom of page 4 of the Office Action:

> "the members of the plurality emit signals at predetermined, different output parameter values wherein the values are selected in accordance with the gain profile" (Office Action pages 4, last line and page 5, first line)

It is submitted that the above is clearly inconsistent with the disclosure and figures of the '922 patent. As stated therein:

> "Briefly, in this invention, the optical powers or the optical signal-to-noise ratios of WDM channels are selectively equalized by judiciously adjusting the input channel powers to achieve equal optical powers or equal signal-to-noise ratios for all channels at the end of the lightwave system. The adjustment of the optical signal of each channel takes into account the total power of all channels together with end-to-end gain for a particular channel normalized by the end-to-end gain for all channels." (Col. 3, lines 13-22, USPN 5,225,922)

In addition to the above, in describing Fig. 2, the '922 patent states:

> "A telemetry link 50 is established between the detector 52 of each channel at the output end of the system and a power adjuster 54 of each channel at the input end of the system. The power adjuster 54 can be either optical amplifiers or optical attenuators or any device which can be used to selectively increase or decrease the power of the optical signal of the associated optical channel. Located in the telemetry link is a microprocessor control 56 coupled to receive signal information from each detector 52 and each optical power adjuster 54 of each channel and to send control signals to each optical power adjuster 54 to control the power of the signal of each channel. In operation, the optical power of one channel may be increased while that of another channel is increased while

that of another channel is decreased left constant or also increased." (Col. 4, lines 19-34 of '922 patent)

Hence, as clearly set forth above, the system of the '922 patent is unlike the claimed structure wherein:

"the members of the plurality emit signals at predetermined, different output parameter values, wherein the values are selected in accordance with the gain profile." (pending claims 1-9)

For at least the above reasons, none of pending claims 1-4, are anticipated by the '922 patent. As described below, none of claims 6-10, 13 and 15-17 are anticipated.

Claim 6 requires:

"a plurality of channel based radiant energy beams wherein the beams exhibit a pre-set profile for a selected parameter in accordance with an inverse of the common gain profile." (pending claims 6-9)

The system of the '922 patent as noted above is quite different. That system incorporates a real time feedback control loop to adjust each of the power adjusters 54 for each of the channels. This is not a one time operation but is clearly a repetitive on-going process as made clear by the '922 patent wherein it is stated:

"Further improvement can be obtained by again applying the relationship A. To do so, the signals at the output end of the transmission path are measured, and these new measurements are used with relationship A to readjust the input signal. Thus, it can be stated that the signal of each channel is fine tuned by recalculating and applying the relationship a second time." (Col. 4, lines 62-68, '922 patent)

The above dynamically described system and process is clearly different from and does not anticipate any of claims 6-9 which require at least:

"the beams exhibit a pre-set profile for a selected parameter in accordance with an inverse of the common gain profile." (pending claims 6-9)

The dynamically changing nature of the characteristics of the feedback control system of the '922 patent are clearly different, distinct and non-anticipatory for at least the above reasons.

The anticipation rejections of claims 10, 13 and 15-17 should also be withdrawn. For example, all of those claims require:

> "predetermining an output parameter of an optical transmitter in accordance with a corresponding value of the inverse function on a per wavelength basis." (pending claims 10-20)

The feedback control system of the '922 patent simply does not incorporate the above step. Input/output levels are dynamically altered to continuously maintain the same power output for all wavelengths, or channels, for the total extent of the optical spans across which the feedback loop extends. This process is unlike the claimed process and does not anticipate the subject claims for at least the above reasons.

In rejecting claims 5, 11, 12, 14, 18-20, 25-27 and 29 as obvious and unpatentable over the disclosure of the '922 patent in view of Chapter II of the publication and Chen et al. US Patent 6,900,932 the Examiner has failed to take into account the fact that the closed loop feedback control system of the '922 patent results in a dynamically changing real time system where input power values and adjustments thereto are based on current feedback from the output power values. Further, the system of the '922 patent can be used with an arbitrary number of cascaded spans. All that is required is that the feedback loop 50, 56 extend between the ends of the cascaded spans.

The Examiner has failed to identify any motivation, suggestion or teaching in any of the documents, namely the system of the '922 patent, the disclosure of the Chapter II publication as well as Chen et al. which would cause one of ordinary skill in the art to modify the closed loop control system of the '922 patent so as to make any of claims 5, 11, 12, 18-20, 25-27 and 29 obvious. It is not sufficient, as the MPEP has made clear along with decisions of the Federal Circuit, to identify multiple documents in the prior art and then simply make an obviousness conclusion.

The fact is that one of ordinary skill in the art would not be motivated to incorporate the structure of Chen et al. into the system of '922 patent since it is unnecessary. As the '922 patent

made clear, that system can adjust output power levels so as to be substantially equal, see Fig. 5 thereof. There would be no need to introduce the additional complexity of structure of Chen et al. to achieve the results of the '922 patent. The only rational for urging such a combination comes from the present application. (Hindsight Reconstruction) Thus, for at least the above reasons, the rejections of obviousness of pending claims 5, 11, 12, 14, 18-20, 25-27 and 29 should be withdrawn.

The obviousness rejection of pending claim 30 in view of Gilliland US patent 6,108,114 fails to address specific limitations of claim 30 and to identify a suggestion motivation or teaching in Gilliland which would cause one of ordinary skill in the art to modify the control system therein so as to make pending claim 30 obvious. In Gilliland et al. control circuits are provided to establish a quiescent output power level from a laser, such as U4. A disable input is also provided to immediately terminate a transmission. When the disable signal has been removed, the control system of Fig. 2 of Gilliland et al. reapplies quiescent power to the laser U4. As described therein:

> "In operation, control circuit 100 is configured to drive semiconductor laser U4 with a stable normalized DC acquiescent current IQ. An AC current component ISIG is superimposed on the acquiescent current, and provides the modulating data signal to be transmitted by the optoelectronic transmitter...Once the quiescent power has been established, control circuit 100 monitors the output power of laser U4 and regulates the DC current flowing through the laser in order to maintain a stable output." (Col. 8, lines 1-17 Gilliland et al.)

Gilliland et al. thus has solved a completely different problem than that addressed and solved by the structure of pending claim 30. The claimed transmitter module incorporates:

> "circuitry coupled to the emitters for predefining an output parameter profile of the emitters in accordance with a pre-established inverse of a composite amplifier gain profile wherein the composite profile incorporates a common gain profile associated with members of each plurality." (pending claim 30)

The Examiner in rejecting claim 30 has stated:

> "Regarding claim 30, Gilliland teaches an optical transmitter (fig. 2), comprising an optical emitter and circuitry coupled to the emitter for generating controlled signal [sic]...the circuitry can adjust an output of the emitters in accordance with a control signal, including an inverse of a composite amplifier gain profile." (last 3 lines, page 10, first line of page 11 Office Action)

However, in rejecting claim 30 the Examiner as noted above, has completely failed to identify the required suggestion motivation or teaching which would cause one of ordinary skill in the art to modify Gilliland et al. which is merely directed to defining and disclosing a control circuit for the laser U4 to establish quiescent output power. Gilliland et al. is completely silent as to optical gain problems in the communications systems. Silence does not provide the required motivation teaching or suggestion. It is only the present application which provides the suggestion, teaching or modification suggested by the Examine. This is clearly a case of improper hindsight reconstruction. For at least the above reasons the rejection of claim 30 should be withdrawn.

Claim 31 has been rejected as obvious in view of the disclosure of '922 patent in view of Goodwin et al. US patent 6,701,089. As described above, the system of the '922 patent is a closed loop control system which feeds back information as to output power levels to the input emitters. This is a dynamic real time ongoing process. Similarly, the disclosure of Goodwin et al., see Fig. 5 thereof, feeds back power information from all amplifiers such as 113, 115, 118 and 120 in the respective spans to equalization software 127 located at the transmitting end of the span. Adjustments are then made in real time at the transmitting end. As stated therein:

> "The transmission powers of the channels are adjusted methodically until the received performance margins of the channels are substantially equal then the power levels of the channels under peak power control mode are increased to just touch the provisional power level." (Abstract, Goodwin et al.)

It is thus undisputable that both the system of the '922 patent and Goodwin et al. are various forms of closed loop control systems which dynamically adjust power levels. This is unlike the claimed method which includes among other limitations:

> "establishing the widest acceptable receiver input power variation and predetermining a maximum number of allowable cascaded light paths in response thereto...pre-establishing transmitter output power in accordance with an inverse profile, and limiting the number of cascaded light paths to the predetermined maximum number." (pending claim 31)

Neither the system of '922 patent nor Goodwin et al. alone or in combination provide any suggestion, teaching or motivation which would cause one of ordinary skill in the art to modify the dynamic closed loop control system of the '922 patent in accordance with the disclosure of Goodwin et al. Indeed, the system of the '922 patent provides constant power output levels on all channels without any need for the apparatus or methodology of Goodwin et al. Both of the cited documents, unlike the methodology of pending claim 31, are directed to unlimited numbers of optical spans. Thus, for at least the above reasons, the rejection of pending claim 31 should be withdrawn.

The rejections of pending claims 32-37 as obvious and unpatentable over Sundelin US Patent 6,091,869 in view of Wilner et al. US Patent 6,341,021 should also be withdrawn. Sundelin is completely silent relative to amplifier based gain variations. The teaching thereof is to adjust the power level of an added signal to "approximately a same level as the power of each passing channel via an optical amplifier" (Abstract, Sundelin).

In this regard Sundelin further states:

> "The power level is adapted, so that the individual power levels of the channels to be added are as equal as possible to those of the channels continuing substantially uninterruptedly through the node 7 from one line cable 1,13 to the opposite one 13,1" (Col. 5, lines 17-22 Sundelin)

Sundelin et al. thus dynamically adjusts power levels of newly added signals.

Wilner et al. does not address the wavelength dependency characteristics of downstream amplifiers. Wilner et al. adjusts signals C1...Cn to equal power output levels at a given module. As stated therein:

> "The power equalization device is driven such that it dynamically controls transmission of the different channels (C1-Cn) to substantially equalize power differentials therebetween" (Abstract, Wilner et al.)

Thus, neither Sundelin nor Wilner et al. alone or in combination suggest disclose or make obvious pending claims 32-37 in that there is at least no teaching suggestion or motivation which would cause one of skill in the art to modify the disclosure of one of those documents in view of the other so as to make:

> "at least one pre-set pre-emphasis module located at one of the elements, the module establishes a predetermined game profile and couples a plurality of optical signals the date of which is adjusted in accordance with the predetermined profile, to an output of one of the links associated with the one element, the module being usable to limit incoming optical signals to the predetermined input range when used with up to a predetermined number of optical links determined, at least in part, by the common input range."(pending claims 32-37)

Thus, for at least the above reasons none of pending claims 32-37 are obvious when Sundelin is considered in view of Wilner et al.

In responding to the Examiner's objection to the drawings, it is submitted that a replacement sheet of drawings which included Figure 1 was filed with Amendment A on April 12, 2005, copy attached. In the replacement sheet the circle on the left hand side of Fig. 1 and the triangle on the right hand side of Fig. 1 include labels as required.

Also submitted herewith is a replacement sheet of drawing with the vertical axis of Figure 5 relabeled in accordance with the Examiner's requirements. A copy marked in red is also attached. It is believed that the previously submitted replacement sheet which included Fig. 1 as well as the presently submitted replacement sheet which includes Fig. 5 address the outstanding drawing objection.

Relative to the Examiner's rejection pursuant to 35 USC § 112 ¶1, several claims namely claim 1, claim 6, claim 10 and claim 30 have been specifically identified as the basis of the Examiner's rejection of claims 1-20 and 30 as failing to comply with the enablement requirement. However, the Examiner's rejection seems to be a semantical issue rather than a

substantive issue. Applicants submit herewith a Declaration of one of skill in the art which explains why the rejected claims comply with the enablement requirement. The claims contain subject matter which was clearly described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

All of the objections, except one to be discussed further subsequently, relate to the phrase "output parameter", or, "a selected parameter". The following comments are supported by the attached Declaration of Mr. K.M. Fisher.

It goes without saying that the claims are to be read by those of skill in the art in light of the specification and figures of the application. It is submitted that the phrase "output parameter values" of claim 1 is clearly supported by the specification and figures of the present application so as to enable one skilled in the art to make and use the invention of claims 1-5. In this regard, as stated in the last full paragraph of page 4 of the present application:

> "Optical networks can incorporate a power pre-emphasis process which minimizes the power fluctuation range at the network's receivers across a predetermined range of wavelengths. The output power of a selected channel is set according to the pre-emphasis process. Circuitry which implements the pre-emphasis process can be set, on a per-channel basis, at manufacture and when combined with a plurality of transmitters can be provided as a module installable in a network without needing further adjustment."

Further, on page 5, second full paragraph, a method is described in accordance with the invention as follows:

> "• establishing a gain profile, across a range of wavelengths, on a per span basis;
>
> • forming an inverse of the gain profile;
>
> • establishing the widest acceptable receiver input power variation and determining a maximum number of allowable cascaded spans;

- raising the inverse of the gain profile to an exponent which corresponds to the maximum allowable number of spans to form a processed inverse profile; and
- setting one of laser output power or optical filter characteristic, on a per-channel basis, in accordance with the processed inverse profile."

As the above makes clear, output parameter which is discussed in the application includes output power, optical filter characteristic or output amplifier gain profile. Further, starting at page 7, second full paragraph, of the application is an extensive discussion of methodology for setting the output power profile of transmitters 24 (shown in Fig. 3 of the present application). Once again, the phrase "output parameter values" clearly finds support in the indicated text on page 7 - page 9 of the present application. The mere fact that the phrase "output parameter values" appears in the claims but not in the detailed description of the application is simply not dispositive.

Similar comments apply to the corresponding rejection of claim 30 which refers to "output parameter profile" and "adjusting an output parameter profile" in view of the discussion in the application which describes how to determine the output power for each of a plurality of lasers. In this regard the Examiner's attention is directed to the last two sentences of page 6 of the present application extending through the first five sentences of page 7 which state:

> "The output power profile for the plurality of transmitters 24 is established, on a per-channel basis, using pre-emphasis circuits 28. Circuits 28 can be set at manufacture. The combination of circuits 28 and transmitters 24 can be configured as one of a plurality of modules 30 installable in optical networks, such as network 20. As discussed in more detail subsequently, no field adjustments are necessary when adding a transmitter/pre-emphasis module, such as module 30 to a network such as network 20."

In accordance with Mr. Fisher's Declaration, it is further submitted that the rejection of the phrase "a selected parameter" in claim 6 should be withdrawn as at the very least, "a selected

parameter" includes laser output power of transmitters 24. As is described, and noted above, second full paragraph of page 5 of the application one of the steps that is referred to in there is:

> "setting one of laser output power or optical filter characteristic, on a per-channel basis, in accordance with the processed inverse profile."

Therefore, "a selected parameter" includes "laser output power or optical filter characteristic".

Finally, the Examiner has rejected claims 6-9, alleging that the phrase "channel based radiant energy beams" is not described in the present application. However, the Examiner's attention in this regard is directed to Mr. Fisher's Declaration and at least to lines 3-7 of page 2 of the application wherein the following is stated:

> "For example, with respect to Fig. 2, a channel having a wavelength on the order of 1532 nm will be amplified with maximum gain. On the other hand, a channel having a wavelength on the order of 1538 nm will be amplified with minimum gain in each amplifier, assuming that all amplifiers exhibit a similar profile."

Quite clearly "channel based radiant energy beams" are described as a generalized category of optical energy sources (that include lasers) that generate energy for at least one channel of a multi-channel communication system. Specifically, lasers provide light amplification of stimulated emission or radiation. Further, as stated on the last two lines of page 6:

> "The output power profile for the plurality of transmitters 24 is established, on a per-channel basis, using pre-emphasis circuits 28."

In addition, the last two lines of page 7 in referring to an equation at the top of page 8 state:

> "The power received after a light path has traversed *S* spans on wavelength channel *i* is,"

The last paragraph of page 8 of the present application also discusses channel based radiant energy beams as follows:

"The pre-emphasis circuitry 28 adjusts the input power so the received power range becomes less dependent on g_i. As illustrated in Fig. 5, pre-emphasis should be inversely proportional to g_i i.e., de-emphasizing the strong channels and emphasizing the weak ones. Preferably, the pre-emphasis circuitry 28 will tilt the graph of Fig. 5 to remove the dependence on g_i. We will use the following input power values for pre-emphasis:"

In view of the above noted amendments to various of the claims, comments relative to the rejections and the prior art, and Mr. Fisher's attached Declaration, allowance of the application is requested.

Respectfully submitted,

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By _____

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Amendments to the Drawings:

The attached sheet of drawings includes changes to Fig. 5. This sheet, which includes Figs. 4-5, replaces the original sheet including Figs. 4-5.

Attachment: Replacement Sheet
Annotated Sheet Showing Changes

FIG. 4

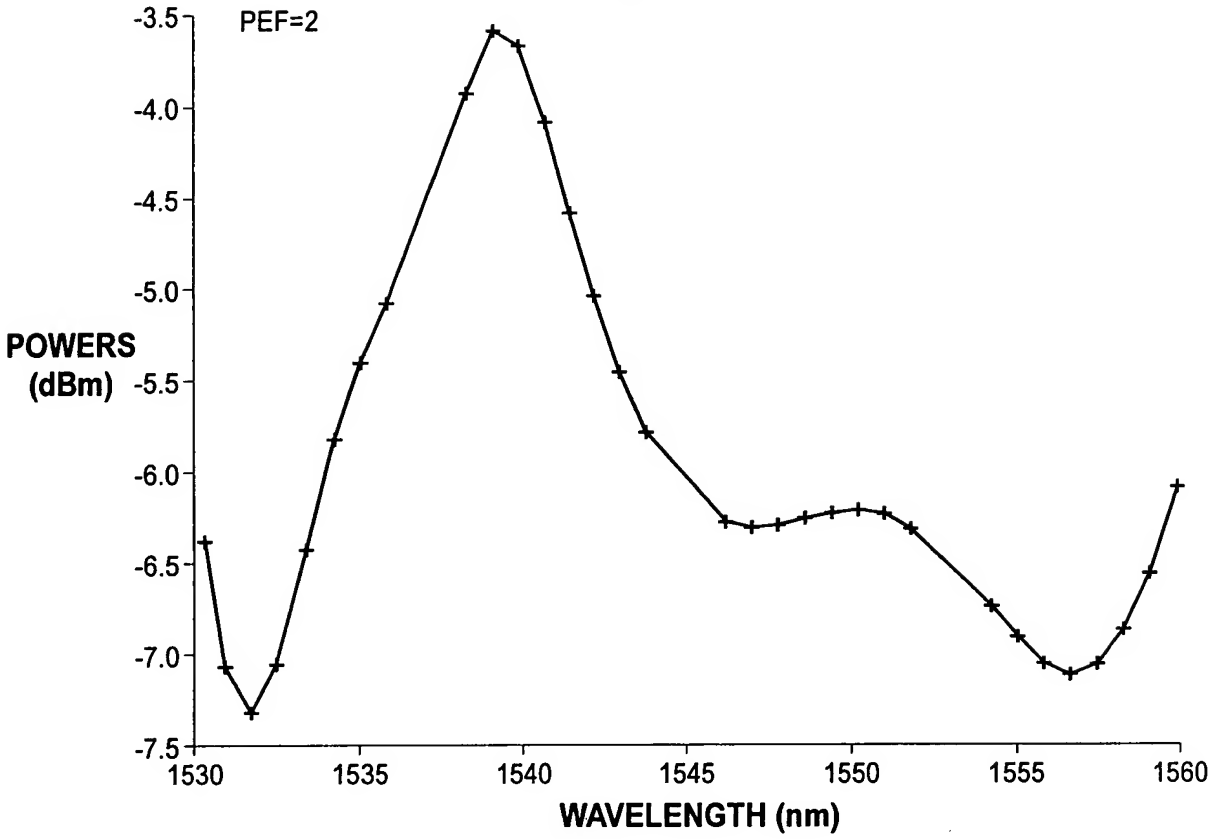

FIG. 5